PXI

NI PXI-8186/8187 User Manual

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Consult the FCC Web site at `www.fcc.gov` for more information.

FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE marking Declaration of Conformity*, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by NI could void the user's authority to operate the equipment under the FCC Rules.

Class A

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user is required to correct the interference at their own expense.

Canadian Department of Communications

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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* The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

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About This Manual

This manual contains detailed instructions for installing and configuring your National Instruments NI PXI-8186/8187 embedded computer kit.

How to Use the Documentation Set

Begin by reading the *NI PXI-8186/8187 Installation Guide*, a brief quick-start guide that describes how to install and get started with your controller.

This manual contains more details about changing the installation or configuration from the defaults and using the hardware.

Conventions

The following conventions appear in this manual:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
	This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
italic	Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.
`monospace bold`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

Related Documentation

The following documents contain information you may find helpful as you read this manual:

- *PICMG 2.0 R3.0 CompactPCI Specification*, PCI Industrial Computers Manufacturers Group
- IEEE Standard P1284.1-1997 *(C/MM) Standard for Information Technology for Transport Independent Printer/System Interface*
- *PCI Local Bus Specification*, Revision 2.2, PCI Special Interest Group
- *PXI Hardware Specification*, Revision 2.1, PXI Systems Alliance
- *PXI Software Specification*, Revision 2.1, PXI Systems Alliance
- *Serialized IRQ Support for PCI Systems Specification*, Revision 6.0, Compaq Computer et al.

1

Introduction

Benefits of PXI

The PXIbus specification defines a compact modular PC platform for industrial instrumentation. PXI leverages the PCI bus, which is the *de facto* standard for today's desktop computer software and hardware designs. As a result, PXI users receive all the benefits of PCI within an architecture that supports mechanical, electrical, and software features tailored to industrial instrumentation, data acquisition, and automation applications.

Well-suited for industrial applications, PXI leverages from the CompactPCI specification, which defines a rugged form factor for PCI that offers superior mechanical integrity and easy installation and removal of hardware components. PXI products offer higher and more carefully defined levels of environmental performance required by the vibration, shock, temperature, and humidity extremes of industrial environments. PXI adds mandatory environmental testing and active cooling to the CompactPCI mechanical specification to ease system integration and ensure multivendor interoperability.

Additionally, PXI meets the more specific needs of instrumentation users by adding an integrated trigger bus and reference clock for multiple-board synchronization, a star trigger bus for very precise timing, and local buses for side-band communication between adjacent peripherals.

NI PXI-8186/8187

Description

The NI PXI-8186/8187 PXI/CompactPCI embedded computer is a high-performance PXI/CompactPCI-compatible system controller. The NI PXI-8186/8187 controller integrates standard I/O features in a single unit by using state-of-the-art packaging. Combining an NI PXI-8186/8187 embedded controller with a PXI-compatible chassis, such as the PXI-1042, results in a fully PC-compatible computer in a compact, rugged package.

The standard I/O on each module includes video, two RS-232 serial ports, a parallel port, two high-speed USB 2.0 ports, 10/100 ENET, PS/2 mouse and keyboard port, a reset button, a PXI trigger, and a PCI-based GPIB controller.

The NI PXI-8186 has a 2.2 GHz processor, all the standard I/O, and a 30 GB (or larger) hard drive.

The NI PXI-8187 has a 2.5 GHz processor, all the standard I/O, and a 30 GB (or larger) hard drive.

Functional Overview

This section contains functional descriptions of each major logic block on the NI PXI-8186/8187 embedded computer.

NI PXI-8186/8187 Functional Description

The NI PXI-8186/8187 is a modular PC in a PXI 3U-size form factor. Figure 1-1 is a functional block diagram of the NI PXI-8186/8187. Following the diagram is a description of each logic block shown.

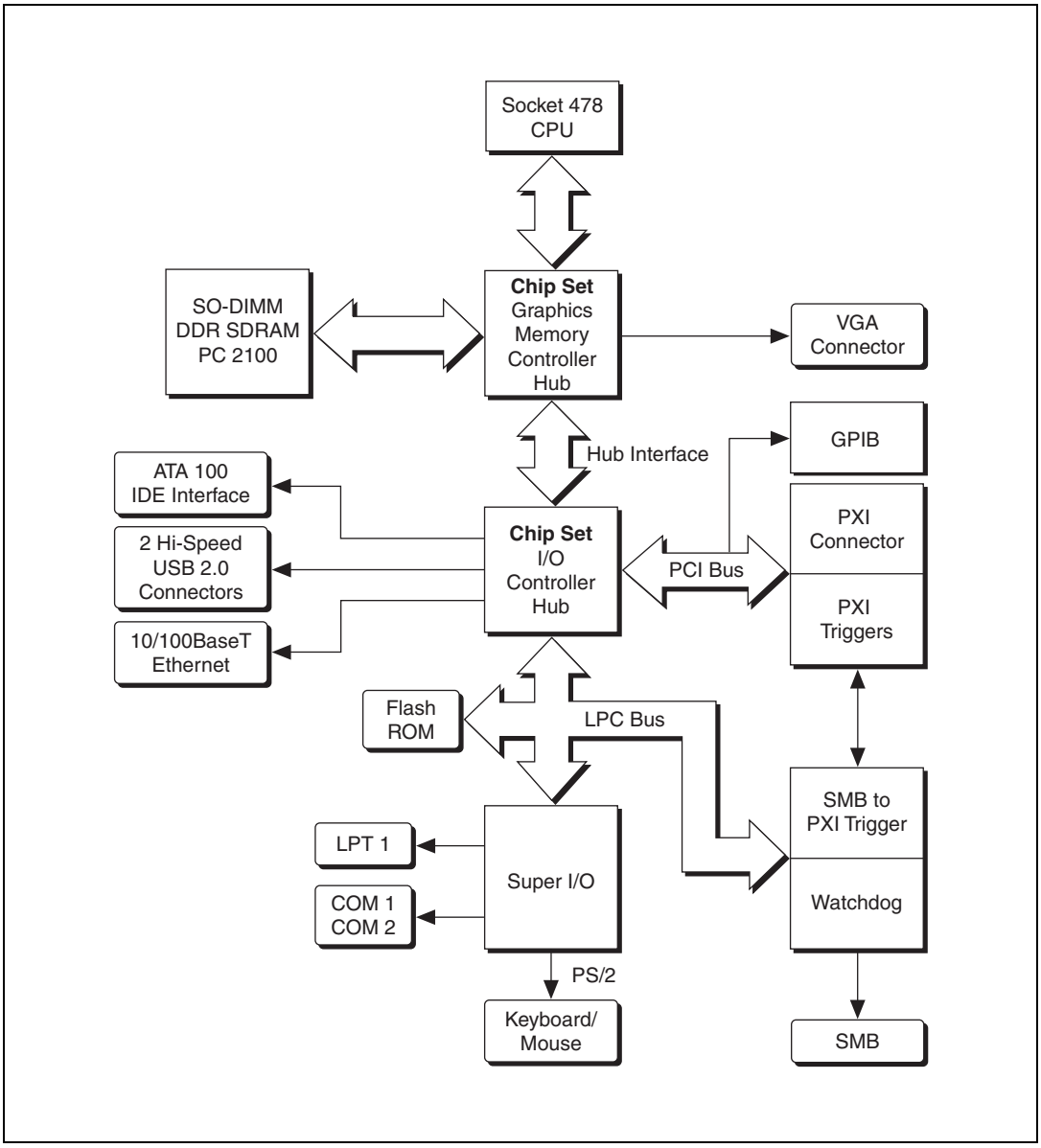


Figure 1-1. NI PXI-8186/8187 Block Diagram

The NI PXI-8186/8187 consists of the following logic blocks on the CPU module and the I/O (daughter card) module. The CPU module has the following logic blocks:

- *Socket 478 CPU* is the socket definition for the Intel Pentium 4 processor families.
- The *SO-DIMM* block consists of a 64-bit DDR SDRAM socket that can hold up to 1 GB.
- The *Chip Set GMCH* connects to the CPU, DDR SDRAM, and video.
- The *SMB to PXI Trigger* provides a routable connection of the PXI triggers to/from the SMB on the front panel.
- The *Watchdog Timer* block consists of a watchdog timer that can reset the controller or generate a trigger.
- The *Chip Set ICH4* connects to the PCI bus USB, IDE, LPC, and Ethernet ports.
- The *USB Connector* connects the chip set to the Hi-Speed USB 2.0 interface.
- The *PXI Connector* connects the NI PXI-8186/8187 to the PXI/CompactPCI backplane.
- The *Keyboard/Mouse* block contains the PS/2 keyboard and mouse interface.
- The *Super I/O* block represents the other peripherals supplied by the NI PXI-8186/8187. The NI PXI-8186/8187 has two serial ports, an ECP/EPP parallel port, and a PS/2 keyboard and mouse port.
- The *IDE* block is dedicated PCI-IDE circuitry providing fast ATA-100 transfers to the internal hard drive. The IDE feature is built into the chip set.
- The *10/100 Enet* connects to either 10 Mbit or 100 Mbit Ethernet interfaces.
- The 2.5 in. hard drive is 30 GB or larger.
- The *GPIB* block contains the GPIB interface.

National Instruments Software

National Instruments has developed several software kits you can use with the NI PXI-8186/8187.

NI-DAQ has an extensive library of functions that you can call from your application programming environment. These functions include routines for analog input (A/D conversion), buffered data acquisition (high-speed

A/D conversion), analog output (D/A conversion), waveform generation, digital I/O, counter/timer operations, SCXI, RTSI, self-calibration, messaging, and acquiring data to extended memory.

NI-VISA is the National Instruments implementation of the VISA specification. VISA is a uniform API for communicating and controlling Serial, GPIB, PXI, VXI, and various other types of instruments. This API aids in the creation of more portable applications and instrument drivers. For information on writing your own PXI instrument driver with NI-VISA, refer to the *NI-VISA Getting Started* manual and the `readme.txt` file in the `NI-VISA` directory.

You also can use the National Instruments LabVIEW, Measurement Studio, and LabWindows™/CVI™ application programs and instrument drivers to ease your programming task. These standardized programs match the modular virtual instrument capability of PXI and can reduce your PXI software development time. These programs feature extensive libraries of GPIB, Serial, and VXI instrument drivers written to take full advantage of direct PXI control. LabVIEW and Measurement Studio include all the tools needed for instrument control, data acquisition, analysis, and presentation.

LabVIEW is an easy-to-use, graphical programming environment you can use to acquire data from thousands of different instruments, including IEEE 488.2 devices, VXI devices, serial devices, PLCs, and plug-in data acquisition boards. After you have acquired raw data, you can convert it into meaningful results using the powerful data analysis routines in LabVIEW. LabVIEW also comes with hundreds of instrument drivers, which dramatically reduce software development time, because you do not have to spend time programming the low-level control of each instrument.

Measurement Studio allows you to choose from standard environments such as Microsoft Visual Basic, Visual C++, and Visual Studio .NET to create your application, using tools specific for each language. With Measurement Studio, you can write programs quickly and easily and modify them as your needs change.

LabWindows/CVI is an interactive ANSI C programming environment designed for building virtual instrument applications. LabWindows/CVI delivers a drag-and-drop editor for building user interfaces, a complete ANSI C environment for building your test program logic, and a collection of automated code generation tools, as well as utilities for building automated test systems, monitoring applications, or laboratory experiments.

2

Installation and Configuration

This chapter contains information about installing and configuring your NI PXI-8186/8187 controller.

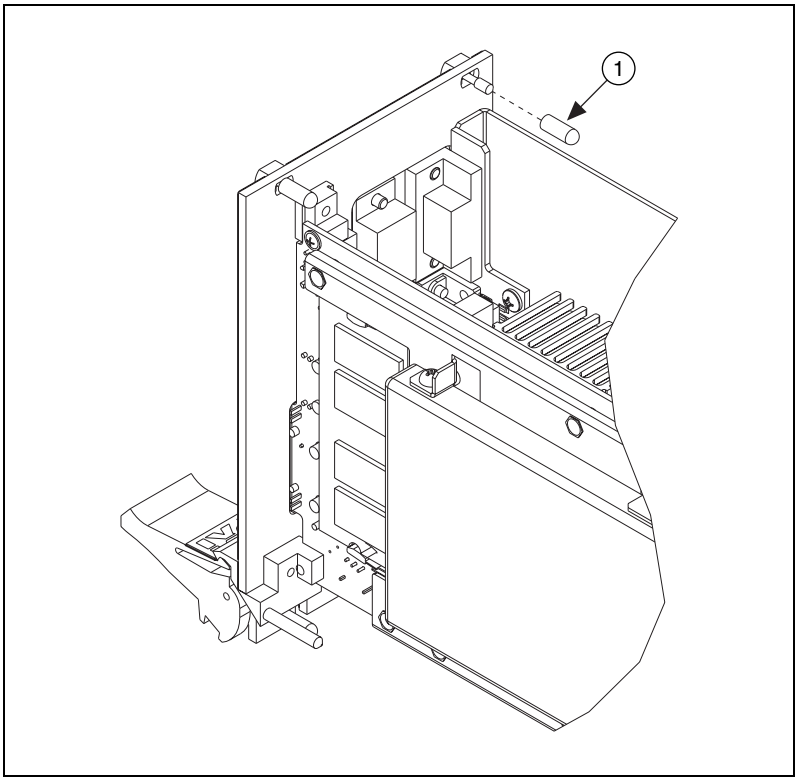
Installing the NI PXI-8186/8187

This section contains general installation instructions for the NI PXI-8186/8187. Consult your PXI chassis user manual for specific instructions and warnings.

1. Plug in your chassis before installing the NI PXI-8186/8187. The power cord grounds the chassis and protects it from electrical damage while you install the module. (Make sure the power switch is turned off.)

Caution To protect both yourself and the chassis from electrical hazards, leave the chassis powered off until you finish installing the NI PXI-8186/8187 module.

2. Remove any filler panels blocking access to the system controller slot (Slot 1) in the chassis.
3. Touch the metal part of the case to discharge any static electricity that might be on your clothes or body.
4. Remove the protective plastic covers from the four bracket-retaining screws as shown in Figure 2-1.



1 Protective Screw Cap (4X)

Figure 2-1. Removing Protective Screw Caps

5. Make sure the injector/ejector handle is in its downward position. Align the NI PXI-8186/8187 with the card guides on the top and bottom of the system controller slot.

Caution Do *not* raise the injector/ejector handle as you insert the NI PXI-8186/8187. The module will not insert properly unless the handle is in its downward position so that it does not interfere with the injector rail on the chassis.

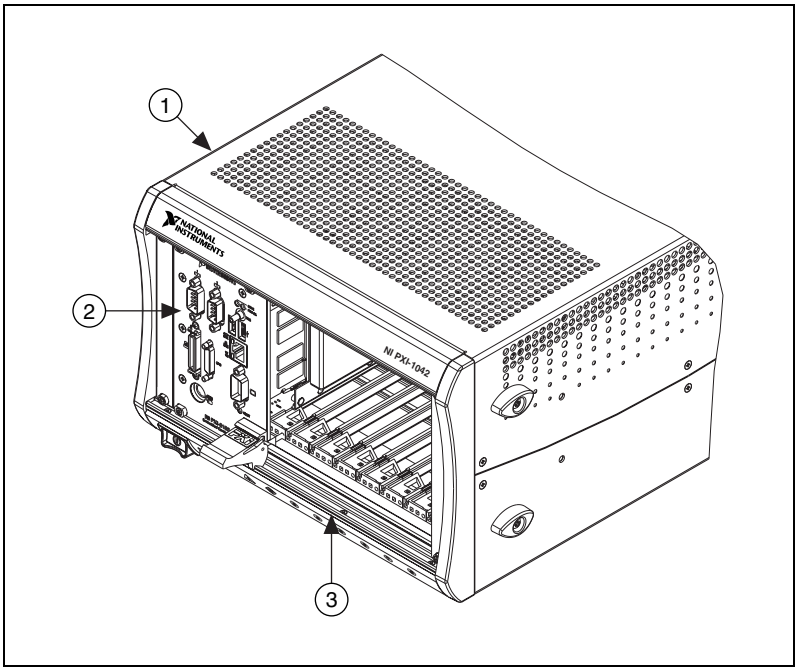
6. Hold the handle as you slowly slide the module into the chassis until the handle catches on the injector/ejector rail.
7. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the NI PXI-8186/8187 should be even with the front panel of the chassis.
8. Tighten the four bracket-retaining screws on the top and bottom of the front panel to secure the NI PXI-8186/8187 to the chassis.

9. Check the installation.
10. Connect the keyboard and mouse to the appropriate connectors. If you are using a PS/2 keyboard and a PS/2 mouse, use the Y-splitter adapter (refer to Figure 4-1, *Y-Splitter Cable*) included with your controller to connect both to the PS/2 connector.

Note The PS/2 connector will operate a keyboard without an adaptor.

11. Connect the VGA monitor video cable to the VGA connector.
12. Connect devices to ports as required by your system configuration.
13. Power on the chassis.
14. Verify that the controller boots. If the controller does not boot, refer to the *What if the NI PXI-8186/8187 does not boot?* section of Chapter 5, *Troubleshooting*.

Figure 2-2 shows an NI PXI-8186 installed in the system controller slot of a National Instruments PXI-1042 chassis. You can place PXI devices in any other slot.



1 PXI-1042 Chassis 2 NI PXI-8186 Controller 3 Injector/Ejector Rail

Figure 2-2. NI PXI-8186 Controller Installed in a PXI Chassis

How to Remove the Controller from the PXI Chassis

The NI PXI-8186/8187 controller is designed for easy handling. To remove the unit from the PXI chassis, complete the following steps:

1. Power off the chassis.
2. Remove the bracket-retaining screws in the front panel.
3. Press the injector/ejector handle down.
4. Slide the unit out of the chassis.

BIOS Setup

You can change the NI PXI-8186/8187 configuration settings in the BIOS setup. The BIOS is the low-level interface between the hardware and PC software that configures and tests your hardware when you boot the system. The BIOS setup program includes menus for configuring settings and enabling NI PXI-8186/8187 controller features.

Most users do not need to use the BIOS setup program, as the NI PXI-8186/8187 controller ships with default settings that work well for most configurations.

Caution Changing BIOS settings may lead to incorrect controller behavior and possibly an unbootable controller. If this happens, follow the instructions for restoring default settings in the *System CMOS* section. In general, do *not* change a setting unless you are absolutely certain what it does.

Entering BIOS Setup

To start the BIOS setup utility, complete the following steps:

1. Power on or reboot your NI PXI-8186/8187 controller.
2. When the message **`Press <DEL> to enter SETUP`** appears, press <Delete> or <Del> on the numeric keypad. The message **`Entering Setup...`** appears, and the setup program is loaded after a short delay.
3. When you first enter the BIOS setup program, it displays the **Main** menu.

Use the following keys to navigate through the BIOS setup:

- **Left Arrow, Right Arrow**—Use these keys to move between the different setup menus. If you are in a submenu, these keys have no effect, and you need to press <Esc> to leave the submenu first. (To use the arrows on the numeric keypad, you must turn off Num Lock.)

- **Up Arrow, Down Arrow**—Use these keys to move between the options within a setup menu. (To use the arrows on the numeric keypad, you must turn off Num Lock.)
- **<Enter>**—Use this key either to enter a submenu or display all available settings for a highlighted configuration option.
- **<Esc>**—Use this key to return the parent menu of a submenu. At the top-level menus, this key serves as a shortcut to the **Exit** menu.
- **<+> and <–>**—Use these keys to cycle between all available settings for a selected configuration option.
- **<Tab>**—Use this key to select time and date fields.

Main Setup Menu

The most commonly accessed and modified BIOS settings are in the **Main** setup menu. The **Main** setup menu includes the following settings:

- **System Time & Date**—This setting controls the time of day, which is stored in a battery-backed real-time clock. Most operating systems also include a way to change this setting. Use <+> and <–> in conjunction with <Enter> and <Tab> to change these values.
- **DMI Event Logging**—This setting brings up the **DMI Event Logging** submenu. (Refer to the *DMI Event Logging Submenu* section.)
- **Require Keyboard to Boot**—When **Yes**, a missing or malfunctioning keyboard causes the BIOS to halt with an error. When **No**, the BIOS allows booting without a keyboard. If you are using a USB keyboard, you may attach it at any time during the powered up state. If you are using a PS/2 keyboard, you must power down the controller and then attach the keyboard. To use this controller in a “headless” mode, you must set this option to **No**. The default value is **Yes**.
- **Num Lock**—This setting indicates whether you turn on Num Lock at boot time. The default value is **On**.
- **Primary/Secondary Master/Slave**—These items display the IDE/ATA devices detected in the system. Normally, you do not need to modify these items. However, if an IDE/ATA device is not autodetected properly, you can specify it manually by pressing <Enter> on an item.
- **System Information**—This setting displays a screen containing important system information about the NI PXI-8186/8187 controller.

DMI Event Logging Submenu

Major errors that occur during the BIOS booting process are stored in battery-backed memory on the controller, and remain there until you view and clear them using this submenu. This logging capability allows a system administrator to detect the historical occurrence of faults on a controller. This submenu includes the following items:

- **View DMI Event Log**—This setting displays a window containing all logged system errors and the time at which they occurred.
- **Mark DMI Events as Read**—This setting prevents any current logged entries from being displayed again. However, all entries remain in battery-backed memory, and you can retrieve them using other DMI software that is beyond the scope of this document.
- **Clear All DMI Event Logs**—When set to **Yes**, this setting clears all entries from the DMI event log on reboot.
- **Event Logging**—This setting controls whether events are logged. Disabling logging has no impact on system performance. The default is **Enabled**.

Advanced Setup Menu

This menu contains BIOS settings that normally do not require modification. If you have specific problems such as unbootable disks or resource conflicts, you may need to examine these settings.

Caution Changing settings in this menu may result in an unstable or unbootable controller. If this happens, follow the procedures outlined in the *System CMOS* section to restore BIOS settings to their factory defaults.

The **Advanced** setup menu includes the following settings:

- **Reset Configuration Data**—A portion of the EEPROM on the controller is designated as the Extended System Configuration Data region (ESCD). The BIOS and Plug-and-Play operating systems use this table to store the *Last Known Good* configuration of system peripherals. If you experience resource conflicts or peripheral malfunction, set this setting to **Yes** to force the BIOS to recreate the ESCD on the next reboot. This is rarely necessary.
- **Integrated Peripherals**—Use this setting to bring up the **Integrated Peripherals** submenu. (Refer to the *Integrated Peripherals Submenu* section.)

- **LabVIEW RT Options**—Use this setting to bring up the **LabVIEW RT Options** submenu. (Refer to the *LabVIEW RT Options Submenu* section.)
- **Local Bus IDE Adapter**—The NI PXI-8186/8187 controller has two integrated IDE/ATA channels (Primary and Secondary), each capable of supporting two ATA devices (Master and Slave). Use this setting to disable one or more of these integrated channels. You should modify this setting only if specified in other sections of this manual. The default is **Both**.
- **Quick Boot Mode**—When you enable this option, certain lengthy BIOS tests that rarely fail are skipped to shorten controller boot time. The default is **Enabled**.
- **Summary Screen**—This setting controls the display of the summary screen shown after BIOS completes its initialization, but before booting takes place. You can disable this screen in the interest of shortening controller boot time. The default is **Disabled**.
- **PXE Network Boot**—This setting enables the option for booting from a network PXE server on the subnet. The default is **Disabled**.
- **Write Protect Boot Sector**—When set to **Yes**, this setting prevents modification of a hard disk boot sector via INT 13h services, which may help prevent certain computer viruses from infecting the controller. This setting does not prevent boot sector modification by 32-bit operating system drivers that access the hard disk directly. The default is **No**.

Integrated Peripherals Submenu

Use this submenu to apply nondefault configurations to the front panel peripherals of an NI PXI-8186/8187 controller. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Serial Port A & B**—This setting enables or disables COM1 and COM2, respectively. You also can change this setting to **Enabled** and modify the base address and Interrupt Request Level (IRQ) of a port. The default is **Auto**, which places COM1 at 0x3F8 IRQ 4 and COM2 at 0x2F8 IRQ 3.
- **Parallel Port**—Use this setting to enable or disable LPT1. You also can change this setting to **Enabled** and modify the base address, IRQ level, and ISA Direct Memory Access (DMA) channel of the port. The default is **Auto**, which places LPT1 at 0x378, IRQ 7, using ISA DMA Channel 3 if necessary.

- **Parallel Port Mode**—The PC industry has created several different modes of operation for this port over the years. Usually, the default setting works for all applications. However, if a parallel port device specifically requires a nondefault setting, you can change it here. The default is **Bidirectional**, for full IEEE 1284 capabilities.
- **Legacy USB Support**—Use this setting to use a USB keyboard and mouse as if they were standard PS/2-style peripherals. You *must* enable this setting to use these devices in operating systems with no USB support and to boot from a USB floppy or CD-ROM. The BIOS setup screen always works with USB keyboards regardless of this setting. Certain real-time applications may require you to disable this setting to reduce loop time jitter. The default is **Enabled**.

LabVIEW RT Options Submenu

Use this menu to configure boot options for LabVIEW RT if it is installed on the controller. If you are not using LabVIEW RT, you should leave these settings as default.

Note These settings override the behavior of the switches on S1. Refer to the *LabVIEW RT Configuration Switches* section for more information. To use the settings from the switches, select **Use Hardware Switch** for each option.

- **Boot Configuration**—This setting selects whether the controller should boot LabVIEW RT, LabVIEW RT Safe Mode, or an installed OS such as Windows XP. The default is **Use Hardware Switch**.
- **Disable Startup VI**—If the controller becomes inaccessible because of a startup VI, this switch can prevent VIs from automatically running at startup. The default is **Use Hardware Switch**.
- **Reset IP Address**—If the controller is deployed to a different subnet from which it was originally configured, or if the current IP address is invalid, use this switch to reset the IP address to 0.0.0.0 during LabVIEW RT startup. The default is **Use Hardware Switch**.

PXI Setup Menu

Use this menu to control and route certain signals on the PXI backplane. Normally, you do not need to modify these settings. However, other sections of this manual may indicate that modifications are necessary and may lead to unpredictable behavior.

- **INTP Routing**—You can route INTP to ISA IRQ 14, for use by a PXI device functioning as a Primary IDE Controller. The default setting is **Not Routed**.
- **INTS Routing**—You can route INTS to ISA IRQ 15, for use by a PXI device functioning as a Secondary IDE Controller. You also can route it to the controller's 21-frame serialized IRQ input, for use by certain PXI carrier cards. The default setting is **Not Routed**.

Note If INTS or INTP is routed to an ISA IRQ, you must disable one or both channels of the integrated IDE/ATA controller for correct operation of this routing.

Boot Setup Menu

This screen displays the boot order of devices associated with the controller. The BIOS proceeds down this list in search of a bootable device. If the BIOS fails to find any bootable device, the message **`Operating System Not Found`** is displayed, and the system halts.

- **Removable Devices**—The boot list includes floppy drives, ZIP drives, and some USB-based devices.
- **Hard Drive**—The boot list includes all IDE/ATA and USB hard disks detected on the system. Press <Enter> on this entry to expand it to select the boot priority of individual IDE/ATA hard drives.
- **CD-ROM Drive**—The boot list includes all classes of CD-ROM drive, including USB drives and IDE/ATA drives.

Note If an SCSI host adapter exists in the system, this menu has an additional entry for SCSI devices.

Note If **PXE Network Boot** is enabled, this menu has an additional entry for the Ethernet interface.

Exiting BIOS Setup

The **Exit** setup menu includes all available options for exiting, saving, and loading the BIOS default configuration. As an alternative to this screen, press <F9> to load BIOS default settings and <F10> to save changes and exit setup.

The **Exit** setup menu includes the following settings:

- **Exit Saving Changes**—Any changes made to BIOS settings are stored in the battery-backed System CMOS. The setup program then exits and reboots the controller.
- **Exit Discarding Changes**—Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The setup program then exits and boots the controller without rebooting first.
- **Load Setup Defaults**—This setting restores all BIOS settings to the factory default. This is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting. Notice that any nondefault settings such as boot order, passwords, and keyboardless operation are restored to their factory defaults. This may produce undesirable behavior, and in heavily customized cases, may cause the controller to malfunction or fail to boot.
- **Discard Changes**—Any changes made to BIOS settings during this session of the BIOS setup program are discarded. Unlike **Exit Discarding Changes**, however, the BIOS setup continues to be active.
- **Save Changes**—Changes made to BIOS settings during this session are committed to battery-backed System CMOS. The setup program remains active, allowing further changes.

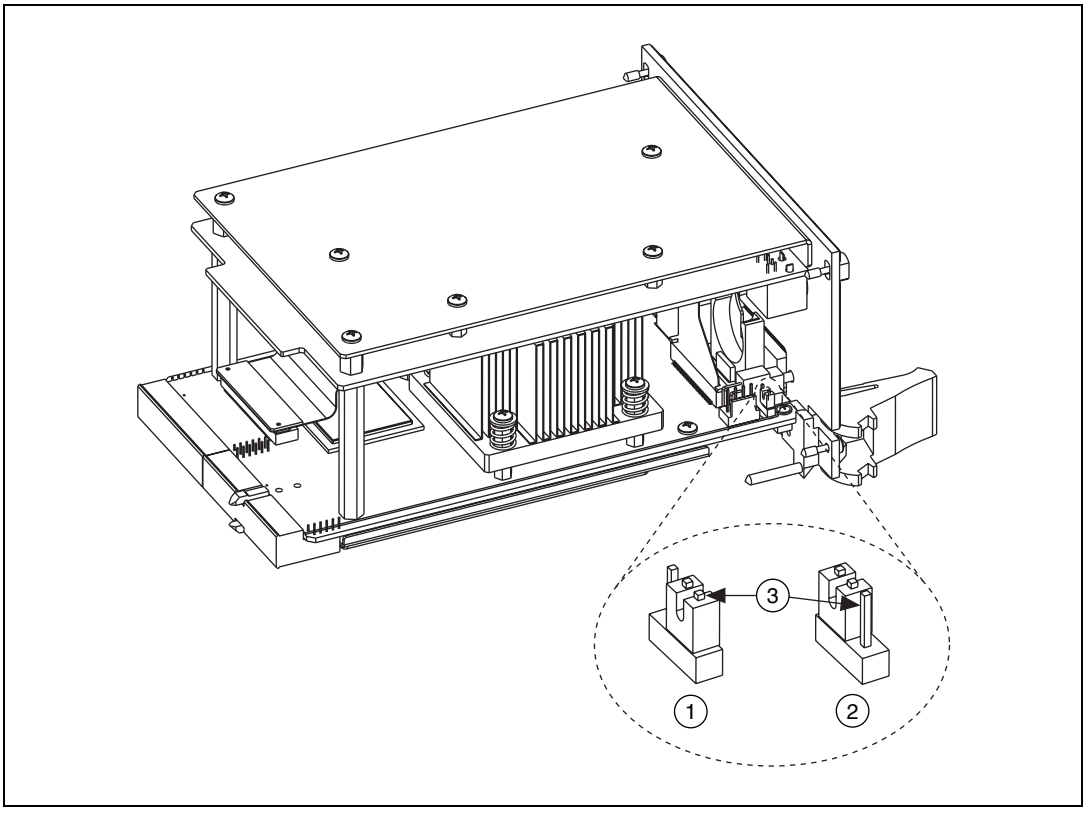
System CMOS

The NI PXI-8186/8187 contains a backed-up memory used to store BIOS configuration information.

Complete the following steps to clear the CMOS contents:

1. Power off the chassis.
2. Remove the controller from the chassis.
3. Move the jumper on W1 from pins 1-2 to pins 2-3, as shown in Figure 2-3.
4. Wait one second. Move the jumper back to pins 1-2.
5. Reinstall the controller in the chassis.

Caution Do *not* leave the jumper on pins 2-3. Doing so decreases battery life. Also, the controller will not boot.



1 Normal Operation (Default)	2 Clear CMOS Contents	3 Pin 1

Figure 2-3. Clearing the CMOS Contents

LabVIEW RT Configuration Switches

Use the LabVIEW RT configuration switches to configure LabVIEW RT if it is installed on the controller. If you are not using LabVIEW RT, these switches should remain in the OFF position. The controller reads these switches only after a system reset. You must reboot the controller for any changes to take place.

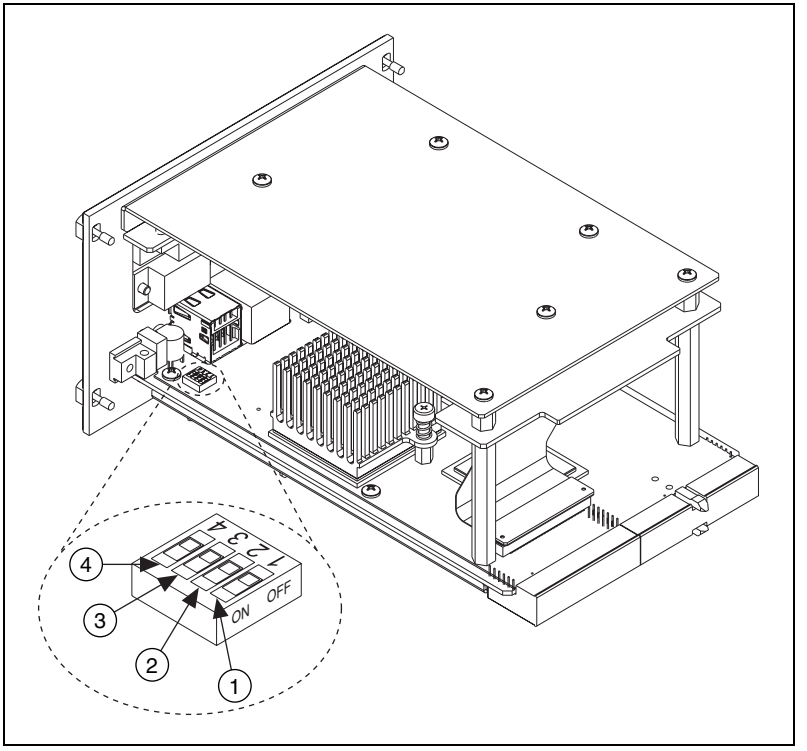
The NI PXI-8186/8187 controller includes the following LabVIEW RT configuration switches:

- **Switch 1—Boot LabVIEW RT**: Set this switch to ON to boot LabVIEW RT.
- **Switch 2—Boot Safe Mode**: Set this switch to ON to boot LabVIEW RT into safe mode to reconfigure TCP/IP settings and

to download or update software from a host computer. This switch overrides the behavior of Switch 1. Booting the controller into safe mode does not start the embedded LabVIEW RT engine. After changing the settings or software, reboot the controller with this switch OFF to resume normal operation.

- **Switch 3—Disable Startup VI**: Set this switch to ON to prevent VIs from automatically running at startup if the controller becomes inaccessible because of a startup VI.
- **Switch 4—Reset IP Address**: Set this switch to ON to reset the IP address to 0.0.0.0 and other TCP/IP settings to their defaults. Use this switch if moving the controller to a different subnet or if the current TCP/IP settings are invalid.

Figure 2-4 shows the location of the LabVIEW RT configuration switches. The switches are shown in the OFF position.



1	Switch 1—Boot LabVIEW RT	3	Switch 3—Disable Startup VI
2	Switch 2—Boot Safe Mode	4	Switch 4—Reset IP Address

Figure 2-4. LabVIEW RT Configuration Switches

Drivers and Software

Files and Directories Installed on Your Hard Drive

Your hard drive includes a directory called `images` in its root that contains software and soft copies of manuals for the peripherals. The directory structure under the `images` directory is logically organized into several levels.

In the `images` directory, you will find a `manuals` directory, an `os` directory, and directories for each computer peripheral.

The `manuals` directory contains quick reference guides, technical reference manuals, and National Instruments software manuals, all in Adobe Acrobat format. To access any manual, change your directory to `c:\images\pxi-8180\manuals` and list the contents of that directory. You will see several files, one corresponding to each peripheral.

The `os` directory contains a subdirectory corresponding to the operating system installed on your computer.

The rest of the directories correspond to each peripheral in your system. Within each of these directories are the drivers for the peripherals. These files and directories are copied exactly from the manufacturer distribution disks, so the naming conventions vary from peripheral to peripheral.

Because the naming conventions may not be completely straightforward, National Instruments provides a text file named `drivers.txt` in the `c:\images\pxi-8180` directory. The `drivers.txt` file explains how to install support for each peripheral. You may want to print this file for reference when you install your peripheral device drivers.

PXI Features

PXI Trigger Connectivity

The SMB connector on the NI PXI-8186/8187 front panel can connect to or from any PXI backplane trigger line through software. A trigger allocation process is needed to prevent two resources from connecting to the same trigger line, resulting in the trigger being double-driven and possibly damaging the hardware. At the time of this manual's publication, this software is not yet available; however, an interim trigger routing software utility is available from National Instruments. Contact National Instruments or refer to KnowledgeBase 2RCBPFWD at `ni.com/support` for more information.

Upgrading RAM

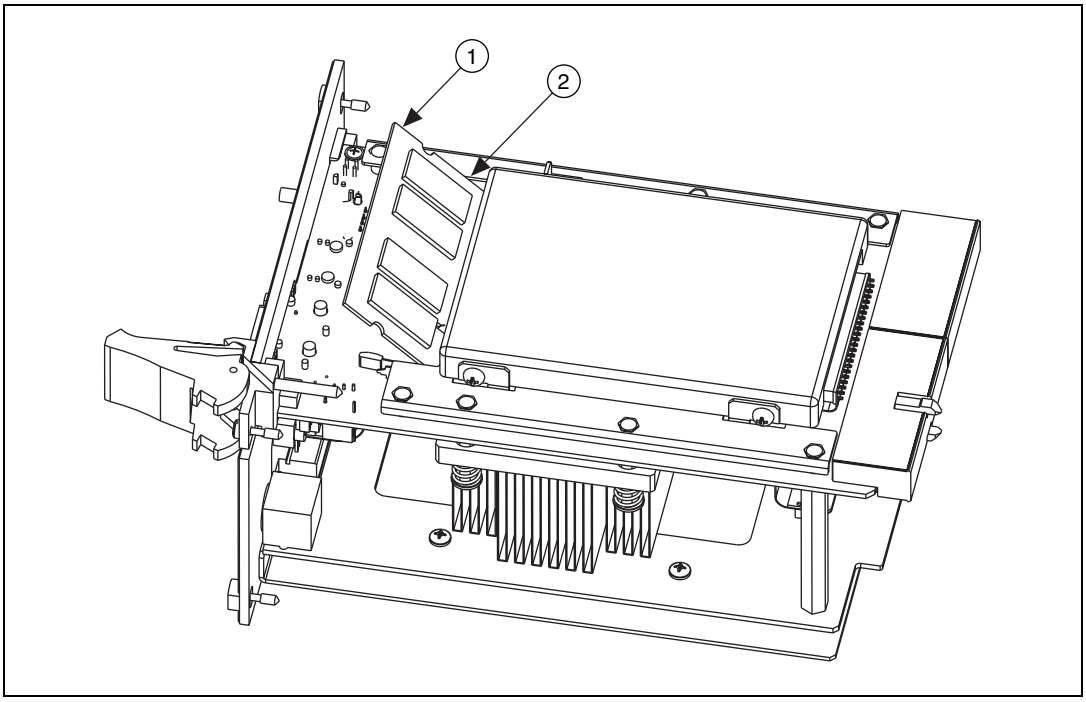
You can change the amount of installed RAM on the NI PXI-8186/8187 by upgrading the SO-DIMM.

To upgrade the RAM, remove the NI PXI-8186/8187 from the PXI chassis. Remove the old SO-DIMM module and install the new SO-DIMM in the socket as shown in Figure 2-5.

National Instruments offers the following types of SO-DIMMs for use with the NI PXI-8186/8187 controller.

- 512 MB, 64 MB × 64, CL 2.5, 1.25 in. max
- 1 GB, 128 MB × 64, CL 2.5, 1.15 in. max

Note National Instruments has tested and verified that the DDR SO-DIMMs we sell work with the NI PXI-8186/8187. We recommend you purchase your DDR SO-DIMM modules from National Instruments. Other off-the-shelf DDR SO-DIMM modules are not guaranteed to work properly.



1 DDR SO-DIMM Module	2 DDR SO-DIMM Socket

Figure 2-5. Installing a DDR SO-DIMM in an NI PXI-8186/8187 Controller

Hard Drive Recovery

NI PXI-8186/8187 controllers include Phoenix Technologies Ltd. Firstware tools, either Recover or Vault, or both. These tools allow you to recover the original factory condition of the hard disk from a small protected area of your hard drive. This protected area contains an image of the hard disk provided to you at the time of shipment. Should you need to restore your software to its original condition, you can access that image by pressing a hot key during the initial boot process. For more information regarding these tools, refer to the documentation on your hard drive in the `c:\Images\Firstware` directory.

Note Your system hot key is <F4>. To access the Phoenix Firstware Recover tool, press and hold <F4> when video first appears during the boot process.

If you need to recover your factory-installed operating system from a CD, you can use the included OS re-installation CD with an external CD-ROM drive such as a USB CD-ROM drive. Boot the PXI controller using the

OS re-installation CD to recover the OS. You also may need to reinstall other software after using the CD to recover the OS.

Note Recovering the OS using Firstware or the re-installation CD erases the contents of your hard disk. Back up any files you want to keep.

Installing an OS

NI PXI-8186/8187 controllers include a preinstalled OS. In some cases, you may want to reinstall the OS or install a different OS. When doing so, consider the following guidelines.

Installing from a CD-ROM

The NI PXI-8186/8187 supports the installation of Windows XP from a USB CD-ROM. However, many other operating systems do not support installation from a USB CD-ROM. For example, Windows 2000 aborts during the install process because it does not have drivers for the CD-ROM device.

With DOS drivers, you can install Windows 9*x* operating systems. However, only a few USB CD-ROM drives have DOS drivers.

As an alternative to a USB CD-ROM drive, you can use an external SCSI CD-ROM with a PXI-SCSI adapter.

Installing from a Network

Complete the following steps to install an OS from a network:

1. Create a network bootdisk. (Refer to the `readme.txt` file in the `netboot` folder on your OS installation CD.)
2. Use another PC on the network with a CD-ROM drive. Share the drive and load the OS installation CD.
3. Boot your NI PXI-8186/8187 using the network boot disk.
4. Run the net utility from the `a:` drive. Map the shared CD-ROM (for example, drive `z:`).
5. Run `winnt.exe` from the `\os\i386` directory.

Note To launch the installation in unattended mode, type:
`z:\os\i386\winnt.exe /u:z:\os\pxi8180.txt /s:z:\os\i386`

Note For additional assistance with installing or changing an operating system, refer to KnowledgeBase 2ZKC02OK at `ni.com/support`.

3

I/O Information

Front Panel Connectors

Table 3-1 lists various peripherals and their corresponding NI PXI-8186/8187 external connectors, bus interfaces, and functions.

Table 3-1. NI PXI-8186/8187 Peripherals Overview

Peripheral	External Connector	Description
Video	VGA (15-pin DSUB)	Intel Extreme Graphics controller
Serial	COM1 (9-pin DSUB)	16550 RS-232 serial port
Serial	COM2 (9-pin DSUB)	16550 RS-232 serial port
Ethernet	LAN (RJ45)	10/100 Ethernet connection
Parallel	Parallel Port (36-pin champ)	IEEE 1284
USB	USB 4-pin Series A stacked receptacle	USB 2.0 capable
Keyboard/mouse	PS/2 (5-pin Din)	PS/2-style keyboard and mouse (mouse requires PS/2 Y splitter)
PXI trigger	Trigger (SMB)	Routing PXI triggers to or from the backplane trigger bus
GPIB device	GPIB (25-pin Micro D)	General-Purpose Interface Bus, IEEE 488.2

Front Panel

Figure 3-1 shows the front panel layout and dimensions of the NI PXI-8186/8187. Dimensions are in inches [millimeters].

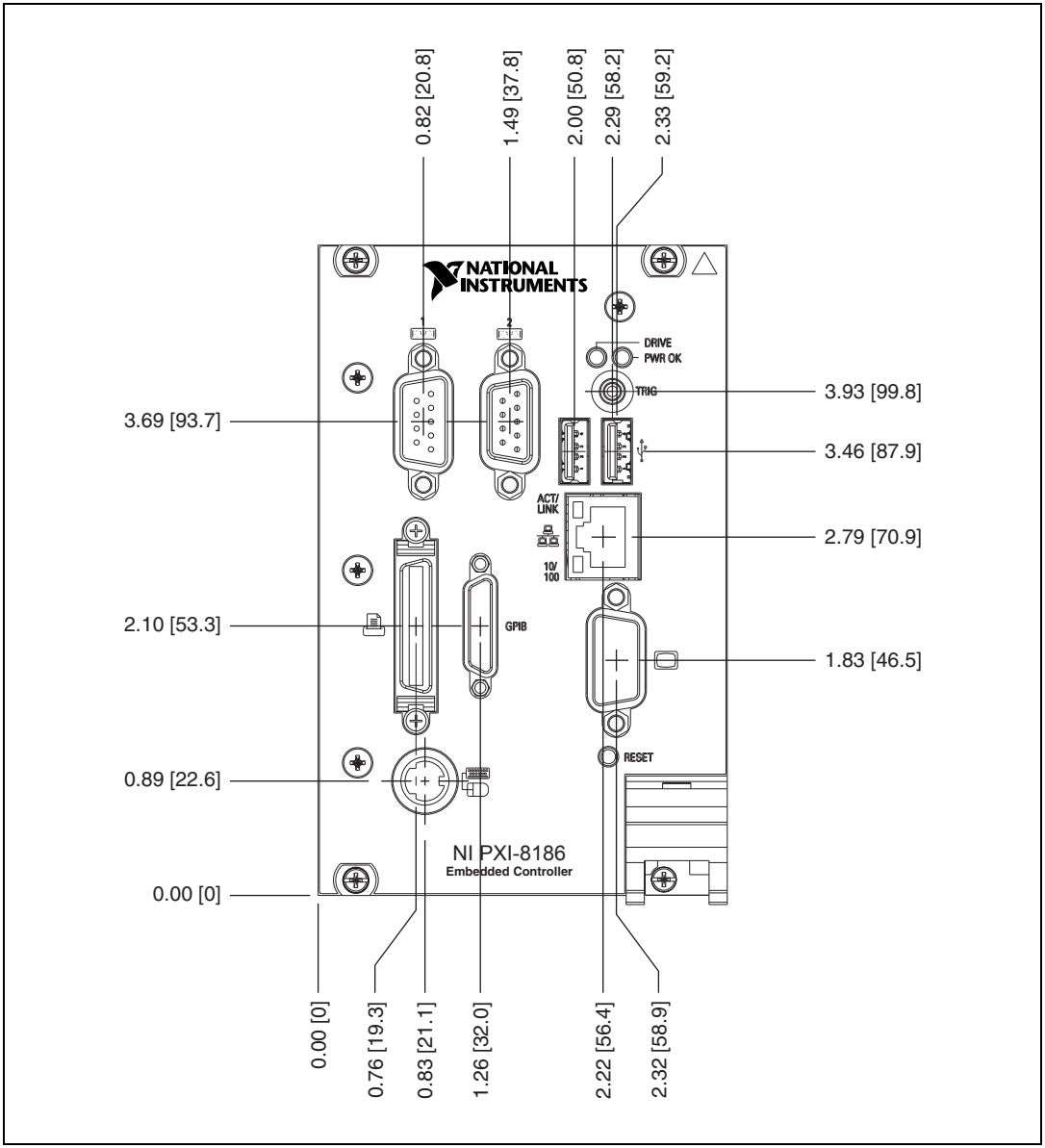


Figure 3-1. NI PXI-8186/8187 Front Panel Layout and Dimensions

VGA

Figure 3-2 shows the location and pinouts for the VGA connector on the NI PXI-8186/8187. Table 3-2 lists and describes the VGA connector signals.

AMP manufactures a mating connector with part numbers 748364-1 (housing) and 748333-2 (pin contact).

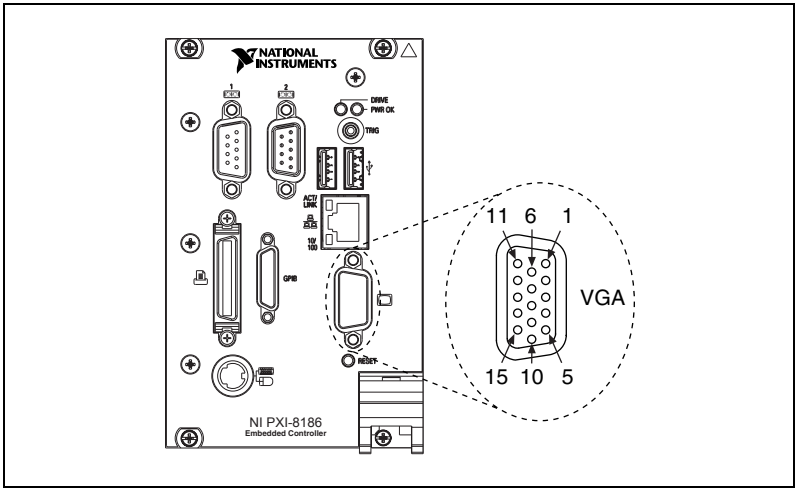


Figure 3-2. VGA Connector Location and Pinout

Table 3-2. VGA Connector Signals

Pin	Signal Name	Signal Description
1	R	Red
2	G	Green
3	B	Blue
4	NC	Not Connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	+5V	5 V

Table 3-2. VGA Connector Signals (Continued)

Pin	Signal Name	Signal Description
10	GND	Ground
11	NC	Not Connected
12	SD	Serial Data
13	HSync	Horizontal Sync
14	VSync	Vertical Sync
15	SC	Serial Clock

COM1 and COM2

Figure 3-3 shows the location and pinouts for the COM1 and COM2 connectors on the NI PXI-8186/8187. Table 3-3 lists and describes the COM1 and COM2 connector signal.

AMP manufactures a serial port mating connector, part number 745491-5.

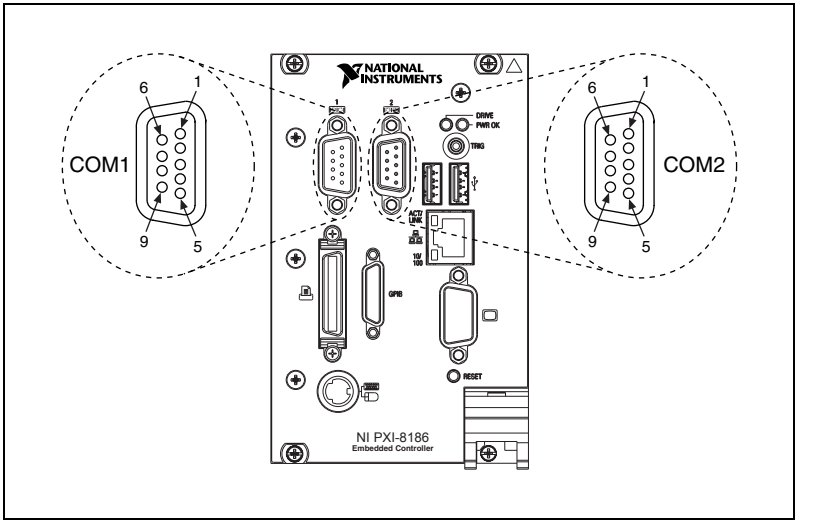


Figure 3-3. COM1 and COM2 Connector Location and Pinout

Table 3-3. COM1 and COM2 Connector Signals

Pin	Signal Name	Signal Description
1	DCD*	Data Carrier Detect
2	RXD*	Receive Data
3	TXD*	Transmit Data
4	DTR*	Data Terminal Ready
5	GND	Ground
6	DSR*	Data Set Ready
7	RTS*	Ready to Send
8	CTS*	Clear to Send
9	RI*	Ring Indicator

Ethernet

Figure 3-4 shows the location and pinouts for the Ethernet connector on the NI PXI-8186/8187. Table 3-4 lists and describes the Ethernet connector signals.

AMP manufactures a mating connector, part number 554739-1.

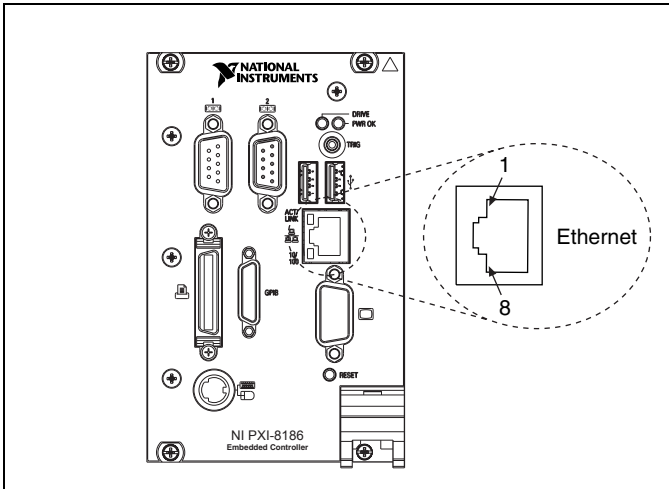


Figure 3-4. Ethernet Connector Location and Pinout

Table 3-4. Ethernet Connector Signals

Pin	Signal Description
1	Differential Transmit
2	Differential Transmit
3	Differential Receive
4	NC
5	NC
6	Differential Receive
7	NC
8	NC

Parallel Port

Figure 3-5 shows the location and pinouts for the IEEE 1284 (parallel) connector on the NI PXI-8186/8187. Table 3-5 lists and describes the IEEE 1284 connector signals.

Parallel port adapter cables are available from National Instruments, part number 777169-01.

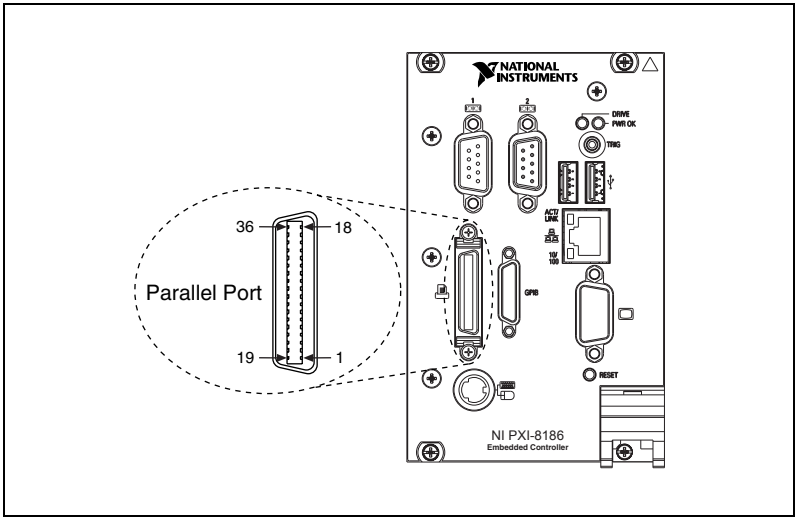


Figure 3-5. Parallel Port Connector Location and Pinout

Table 3-5. Parallel Port Connector Signals

Pin	Default Configuration (LPT)	
	Signal Name	**Signal Description**
1	BUSY	Device Busy
2	SLCT	Select
3	ACK*	Acknowledge
4	FAULT*(ERROR*)	Fault
5	PAPEREND	Paper End
6	PD0	Data Bit 0
7	PD1	Data Bit 1
8	PD 2	Data Bit 2
9	PD3	Data Bit 3
10	PD4	Data Bit 4
11	PD5	Data Bit 5
12	PD6	Data Bit 6
13	PD7	Data Bit 7
14	INIT*	Initialize Printer
15	STROBE*	Strobe
16	SLCTIN*	Select Input
17	AUTOFD*	Auto Line Feed
18	+5V	+5 V
19–35	GND	Ground
36	NC	Not Connected

Universal Serial Bus

Figure 3-6 shows the location and pinouts for the Universal Serial Bus (USB) connector on the NI PXI-8186/8187. Table 3-6 lists and describes the USB connector signals.

AMP manufactures a USB mating connector, part number 787633.

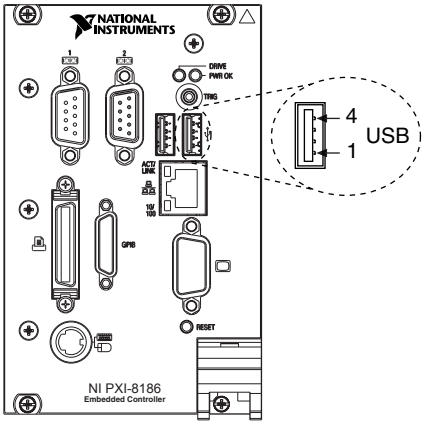


Figure 3-6. USB Connector Location and Pinout

Table 3-6. USB Connector Signals

Pin	Signal Name	Signal Description
1	VCC	Cable Power (+5 V)
2	–Data	USB Data–
3	+Data	USB Data+
4	GND	Ground

PS/2

Figure 3-7 shows the location and pinouts for the PS/2 connector on the NI PXI-8186/8187. Table 3-7 lists and describes the PS/2 connector signals.

To connect both a PS/2 keyboard and PS/2 mouse to the NI PXI-8186/8187, use the Y-splitter adapter cable included with your controller (refer to Figure 4-1, *Y-Splitter Cable*).

Replacement Y-splitter adapter cables are available from National Instruments, part number 778713-01.

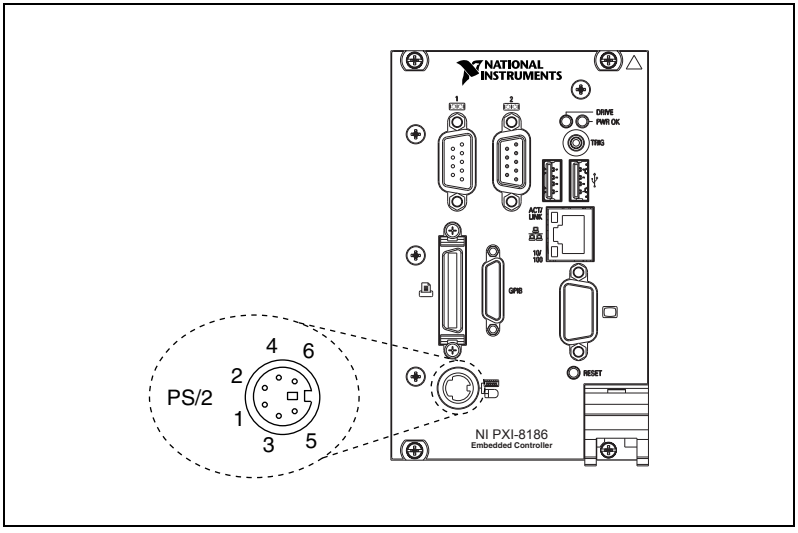


Figure 3-7. PS/2 Connector Location and Pinout

Table 3-7. PS/2 Connector Signals

Pin	Signal Name	Signal Description	Y-Splitter Keyboard	Y-Splitter Mouse
1	DATA	Data Keyboard	Data Keyboard	Data Mouse
2	NC	Data Mouse	NC	NC
3	GND	Ground	GND	GND
4	+5V	+5 V	+ 5	+ 5
5	CLK	Clock Keyboard	Clock Keyboard	Clock Mouse
6	NC	Clock Mouse	NC	NC

Trigger

The TRG connector is the software-controlled trigger connection for routing PXI triggers to or from the backplane trigger bus.

Figure 3-8 shows the TRG connector location on the NI PXI-8186/8187. Table 3-8 lists and describes the trigger connector signals.

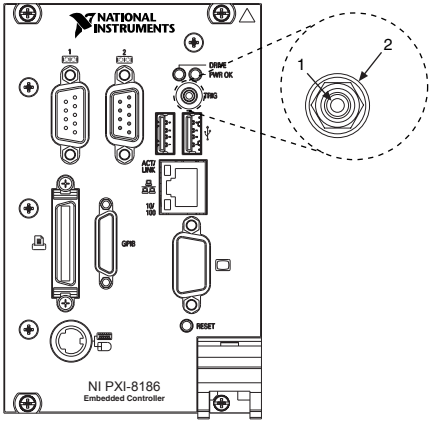


Figure 3-8. TRG Connector Location and Pinout

Table 3-8. TRG Connector Signals

Pin	Signal Name	Signal Description
1	TRIG	Trigger
2 (Shield)	GND	Ground

GPIB (IEEE 488.2)

Figure 3-9 shows the location and pinouts for the GPIB connector on the NI PXI-8186/8187. Table 3-9 lists and describes the GPIB connector signals.

ITT Canon manufactures a GPIB mating connector, part number MDSM-25SC-Z11-V51.

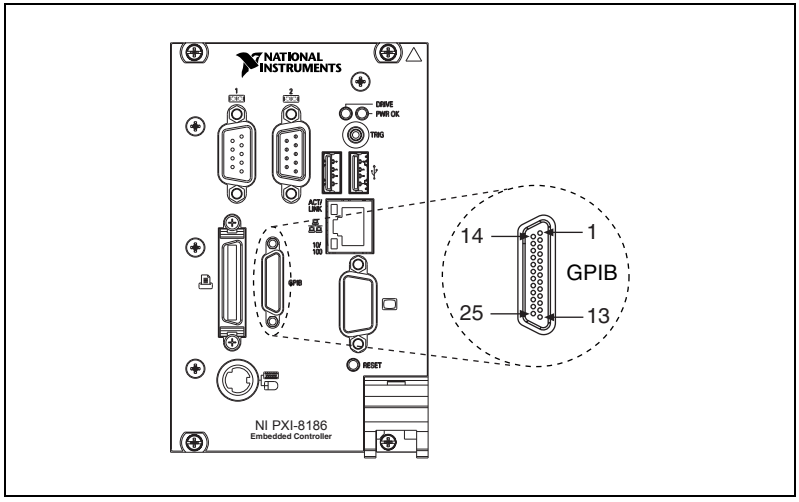


Figure 3-9. GPIB Connector Location and Pinout

Table 3-9. GPIB Connector Signals

Pin	Signal Name	Signal Description
1	DIO1*	Data Bit 1
2	DIO2*	Data Bit 2
3	DIO3*	Data Bit 3
4	DIO4*	Data Bit 4
5	EOI*	End or Identify
6	DAV*	Data Valid
7	NRFD*	Not Ready for Data
8	NDAC*	Not Data Accepted
9	IFC*	Interface Clear

Table 3-9. GPIB Connector Signals (Continued)

Pin	Signal Name	Signal Description
10	SRQ*	Service Request
11	ATN*	Attention
12	SHIELD	Chassis ground
13	DIO5*	Data Bit 5
14	DIO6*	Data Bit 6
15	DIO7*	Data Bit 7
16	DIO8*	Data Bit 8
17	REN*	Remote Enable
18–25	GND	Logic Ground

Front Panel Features

The NI PXI-8186/8187 has the following front-panel features:

- A system reset pushbutton (press the button to generate a reset to the controller)
- Two front panel LEDs that show PC status
  - The **POWER OK** LED indicates that the power is on and reset is no longer asserted.
  - The **DRIVE** LED indicates when an access to the internal hard disk is occurring.

Data Storage

The NI PXI-8186/8187 has the following data storage features:

- Internal IDE hard drive
  - 2.5 in. notebook hard drive
  - Supports up to ATA-5 (UDMA 100)
- USB storage support—USB CD-ROM, mass storage device, or floppy drive

4

Common Configuration Questions

This chapter answers common configuration questions you may have when using the NI PXI-8186/8187 embedded controller.

General Questions

What do the LEDs on the NI PXI-8186/8187 front panel mean?

The green LED indicates the power supplies to/on the NI PXI-8186/8187 are within spec. The supplies monitored are 3.3 V, 5 V, +12 V.
The hard drive LED lights when there is hard drive activity on the NI PXI-8186/8187.

How do I check the configuration of the memory, hard drive, time/date, and so on?

You can view these parameters in the BIOS setup. To enter the BIOS setup, reboot the NI PXI-8186/8187 and press <Delete> during the memory tests. Refer to the *Entering BIOS Setup* section of Chapter 2, *Installation and Configuration*, for more information.

Can I use the internal IDE drive and an external SCSI hard drive at the same time?

Yes.

Boot Options

What devices can I boot from?

The NI PXI-8186/8187 can boot from the following devices:

- The internal IDE hard drive
- An external SCSI hard drive or CD-ROM if an SCSI adapter, such as the PXI-8214, is used
- A network PXE server on the same subnet

- An external USB mass storage device such as a USB hard drive or CD-ROM
- An external USB floppy drive

Note There are some limitations when booting from a USB device. Windows XP can be installed from a USB CD-ROM, but earlier versions of Windows cannot. The NI PXI-8186/8187 BIOS configures the USB devices so that they will work in a DOS environment.

How do I configure the controller to boot from these devices?

There are two methods.

- Enter Setup and select the **Boot** menu. You will see a list of all bootable devices, ordered by device type. You can set the boot order using <+> and <–>. Set the order by device type and set the order for the devices listed within the device type.
- To boot from a different device without permanently changing the boot order, press <Esc> during POST. After the BIOS completes the POST and just before the controller boots the OS, the **Boot** menu is displayed. You can select the device type you want to boot from.

Cables and Connections

How do I plug both a PS/2 mouse and PS/2 keyboard into the controller?

The NI PXI-8186/8187 has a combined PS/2 mouse and PS/2 keyboard connector, so you need to use the PS/2 Y-splitter cable shipped with the NI PXI-8186/8187, shown in Figure 4-1, to connect both a PS/2 mouse and PS/2 keyboard.

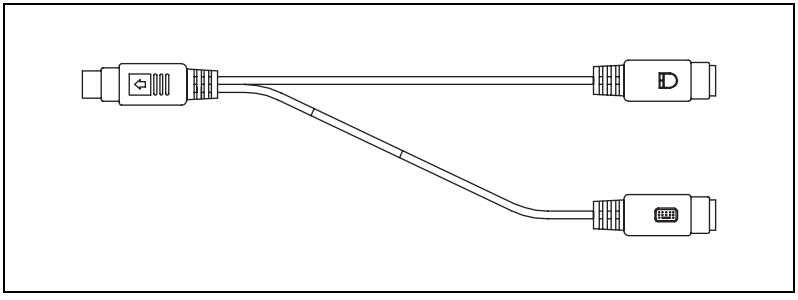


Figure 4-1. Y-Splitter Cable

How do I get a replacement Y-splitter cable?

Y-splitter cables, part number 778713-01, are available through the online catalog at `ni.com/products`.

What if I don't have a Y-splitter cable? Can I still use a mouse and keyboard?

If you do not have a Y-splitter cable, plug a PS/2 keyboard into the PS/2 combo connector. However, you cannot use a PS/2 mouse without the Y-splitter, so use a serial or USB mouse.

How do I connect a standard 25-pin LPT cable to the NI PXI-8186/8187?

The NI PXI-8186/8187 uses a type C LPT connector. Most parallel port devices use a type A connector. To use a device with a standard type A LPT connector, you need to use a type C-to-type A LPT adapter. Parallel port adapter cables, part number 777169-01, are available through the online catalog at `ni.com/products`.

Software Driver Installation

How do I install or reinstall the video driver?

Refer to the `Drivers.txt` file on the hard drive or recovery CD-ROM.

How do I install or reinstall the Ethernet driver?

Refer to the `Drivers.txt` file on the hard drive or recovery CD-ROM.

How do I install or reinstall the GPIB driver?

The NI-488.2 driver for your GPIB port is installed by default when your controller is first shipped from the factory. To change the default installed driver, complete the following steps:

1. Download the latest GPIB driver from `ni.com/downloads`.
2. Install the driver and verify that the driver has properly detected the GPIB driver in the Device Manager. If you need more assistance, refer to `ni.com/support/install`.

Note Click the **Scan for Hardware Changes in the Device Manager** button to force redetection of the GPIB hardware after installing the driver.

How do I install software from a CD?

The compact size of the NI PXI-8186/8187 does not allow for an integrated CD-ROM drive. If you are using Windows XP, you have the following options:

- **USB CD-ROM**—Windows XP supports installing from a USB CD-ROM using a bootable installation CD.
- **SCSI, LPT, or PC Card-based CD-ROM**—Other types of CD-ROM drives are available. Check with the vendor to make sure Windows XP supports the drive.
- **Mapped network drive**—You can use the Ethernet to connect to another computer. If you share the CD-ROM drive on the other computer, you can map the shared CD-ROM drive to a drive letter on the NI PXI-8186/8187.

Chassis Configuration

How do I set up the NI PXI-8186/8187 to work with my chassis?

Configuration of the PXI system is handled through Measurement & Automation Explorer (MAX), included with the software pre-installed on your controller. MAX creates the `pxisys.ini` file, which defines the layout and parameters of your PXI system.

The configuration steps for single or multiple-chassis systems are the same.

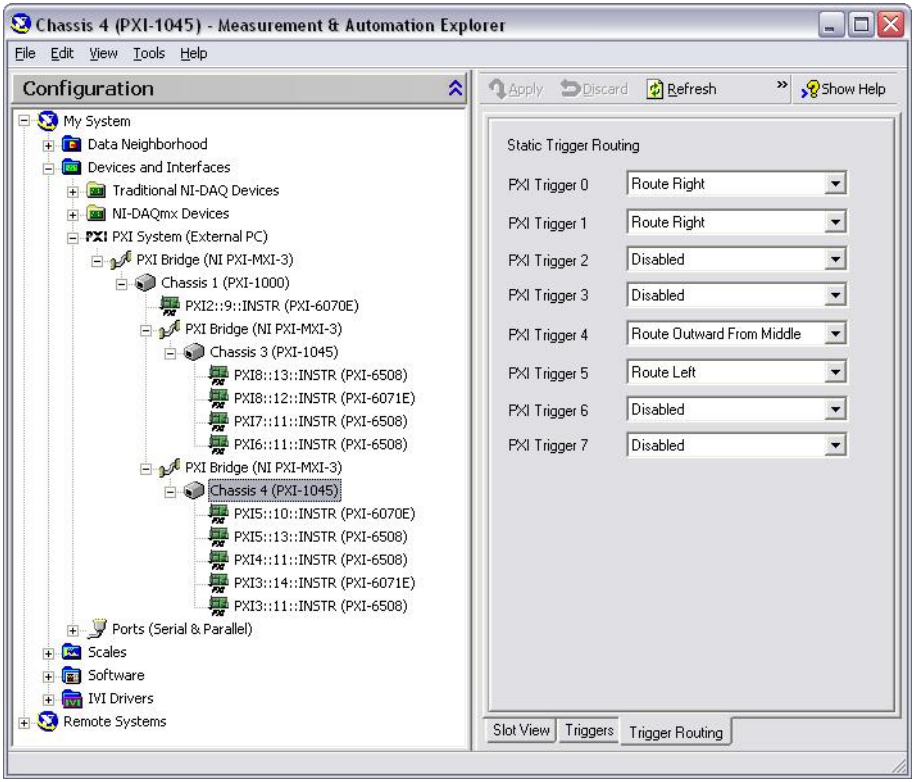


Figure 4-2. Multichassis Configuration in MAX

Basic PXI System Configuration

1. Launch MAX.
2. In the **Configuration** tree, click the **Devices and Interfaces** branch to expand it.
3. If the PXI system controller has not yet been configured, it is labeled **PXI System (Unidentified)**. Right-click this entry to display the pop-up menu, then select the appropriate controller model from the **Identify As** submenu.
4. Click the **PXI System** controller. The chassis (or multiple chassis, in a multichassis configuration) is listed below it. Identify each chassis by right-clicking its entry, then selecting the appropriate chassis model through the **Identify As** submenu. Further expanding the **PXI System** branch shows all devices in the system that can be recognized by NI-VISA. When your controller and all your chassis are identified, the required `pxisys.ini` file is complete.

The PXI specification allows many combinations of PXI chassis and system modules. To assist system integrators, the manufacturers of PXI chassis and system modules must document the capabilities of their products. The minimum documentation requirements are contained in `.ini` files, which consist of ASCII text. System integrators, configuration utilities, and device drivers can use these `.ini` files.

The capability documentation for the chassis is contained in a `chassis.ini` file provided by the chassis manufacturer. The information in this file is combined with information about the system controller to create a single system initialization file called `pxisys.ini` (PXI System Initialization). The NI PXI-8186/8187 uses MAX to generate the `pxisys.ini` file from the `chassis.ini` file.

Device drivers and other utility software read the `pxisys.ini` file to obtain system information. For detailed information about initialization files, refer to the PXI specification at `www.pxisa.org`.

Upgrade Information

How do I upgrade system memory?

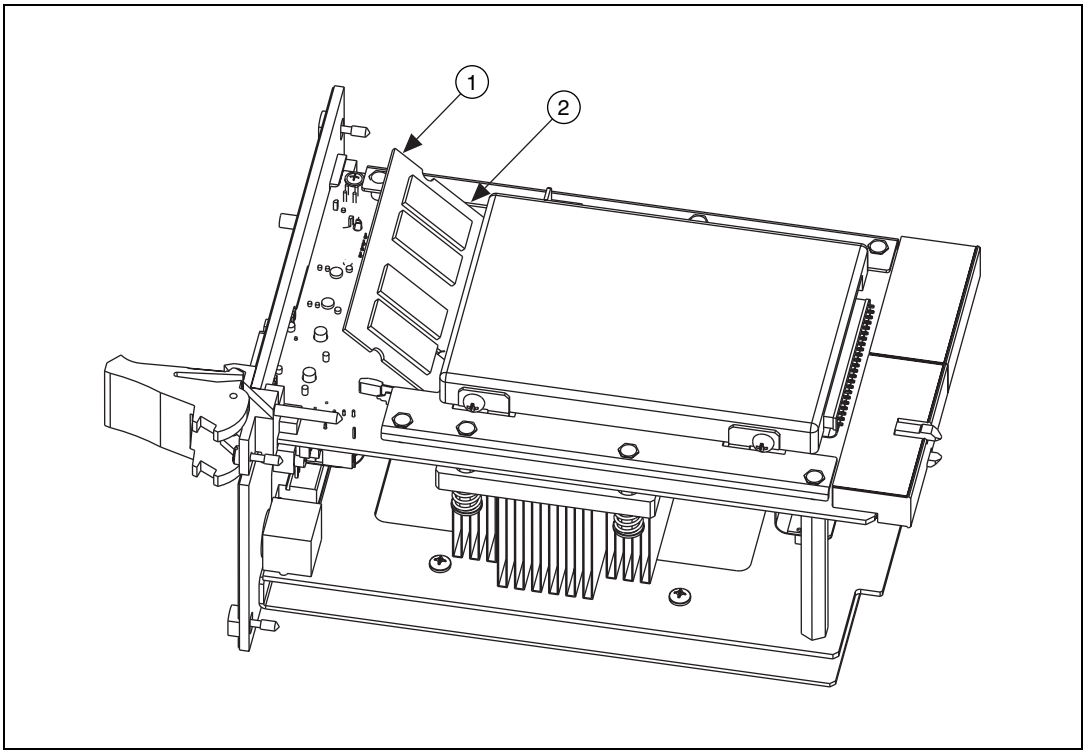
You can change the amount of installed RAM on the NI PXI-8186/8187 by upgrading the DDR SO-DIMM.

To upgrade the RAM, remove the NI PXI-8186/8187 from the PXI chassis. Remove the old SO-DIMM module and install the new SO-DIMM in the socket as shown in Figure 4-3.

National Instruments offers the following types of DDR SO-DIMMs for use with the NI PXI-8186/8187 controller.

- 512 MB, 64 MB × 64, CL 2.5, 1.25 in. max
- 1 GB, 128 MB × 64, CL 2.5, 1.15 in. max

Note National Instruments has tested and verified that the SO-DIMMs we sell work with the NI PXI-8186/8187. We recommend you purchase your SO-DIMM modules from National Instruments. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.



1 DDR SO-DIMM Module	2 DDR SO-DIMM Socket

Figure 4-3. Installing a DDR SO-DIMM in an NI PXI-8186/8187 Controller

How do I flash a new BIOS?

You need to download the new BIOS from `ni.com/support/pxisupp.htm`. To download the new BIOS, follow the instructions on the Web site.

Where do I get the latest software drivers?

You can download the latest drivers from `ni.com/support/pxisupp.htm`.

My NI PXI-8186/8187 does not have an internal floppy drive. Is there a way to use an external drive?

Yes. The NI PXI-8186/8187 controller supports and can boot from USB floppy drives. A USB floppy drive will not work with Windows NT4, but will work with Windows 2000 or Windows XP. Refer to the *Boot Options* section for more information.

A USB floppy drive is available from National Instruments, part number 778492-02.

PXI Configuration

How do I use the SMB trigger on the front panel?

For details, refer to the *PXI Features* section of Chapter 2, *Installation and Configuration*.

Why doesn't the NI PXI-8186/8187 work with the PXI-8220?

A serialized IRQ conflict with the PXI-8220 and the NI PXI-8186/8187 prevents PC cards using ISA interrupts from working with the NI PXI-8186/8187 controllers. The PXI-8221 is designed to work with the NI PXI-8186/8187 and should be used instead.

5

Troubleshooting

This chapter answers common troubleshooting questions you may have when using the NI PXI-8186/8187 embedded computer.

What if the NI PXI-8186/8187 does not boot?

Several problems can cause a controller not to boot. Here are some things to look for and possible solutions.

Things to Notice:

- Which LEDs come on? The **Power OK** LED should stay lit. The **Drive** LED should blink during boot as the disk is accessed.
- What appears on the display? Does it hang at some particular point (BIOS, Operating System, and so on.)? If nothing appears on the screen, try a different monitor. Does your monitor work with a different PC? If it hangs, note the last screen output that you saw for reference when consulting National Instruments technical support.
- What has changed about the system? Did you recently move the system? Was there electrical storm activity? Did you recently add a new module, memory chip, or piece of software?

Things to Try:

- Make sure the chassis is plugged in to a working power source.
- Check any fuses or circuit breakers in the chassis or other power supply (possibly a UPS).
- Make sure the controller module is firmly seated in the chassis.
- Remove all other modules from the chassis.
- Remove any nonessential cables or devices.
- Try the controller in a different chassis.
- Try a similar controller in this same chassis.
- Recover the hard drive on the controller. (Refer to the *Hard Drive Recovery* section of Chapter 2, *Installation and Configuration*.)
- Clear the CMOS. (Refer to the *System CMOS* section of Chapter 2, *Installation and Configuration*.)

My controller boots fine until I get to Windows, at which point I cannot read the screen. This may include garbled output, white screen, black screen, or an out of synch message from the monitor.

This problem usually results from having the video card output set past the limits of the monitor. You will need to boot Windows in Safe Mode. To do this, reboot the controller. As Windows begins to boot, hold down <F8>. You should now be able to reset the video driver to lower settings. Try setting the resolution to 640 × 480 and the refresh rate to 60 Hz. Once you reboot, you can raise these values again, using the test option in Windows. These settings are accessible through the **Advanced** tab of the **Display** item in the **Control Panel**. Alternately, you can try a different monitor, preferably a newer and larger one.

My system boots fine as long as a particular module is not in my chassis.

The most common cause of this is a damaged module. Try the module in a different chassis or with a different controller. Also, remove any external cables or terminal blocks connected to the system. If the module does not work in these cases, it is likely damaged. Contact the module manufacturer for further troubleshooting.

Refer to the KnowledgeBase or product manuals section at `ni.com` for more information specific to the chassis and controller with which you are having difficulties.

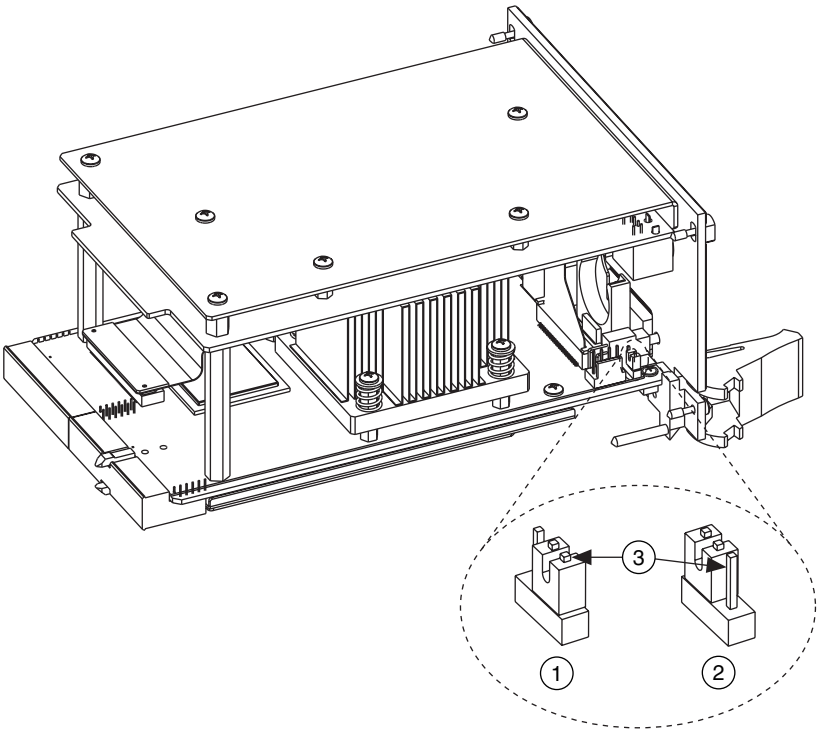
My CMOS is corrupted. How do I set it back to default?

1. Enter the BIOS setup program as described in the *Entering BIOS Setup* section of Chapter 2, *Installation and Configuration*.
2. Press <F9> to load BIOS default**s**.
3. Answer **Y** (Yes) to the verification prompt.
4. Select **Save and Exit Setup**.

As an alternative method, complete the following steps:

1. Power off the chassis.
2. Remove the controller from the chassis.
3. Move the jumper on W1 from pins 1-2 to pins 2-3 as shown in Figure 5-1.
4. Wait one second. Move the jumper back to pins 1-2.
5. Reinstall the controller in the chassis.

Caution Do *not* leave the jumper on pins 2-3. Doing so decreases battery life. Also, the controller will not boot.



1 Normal Operation (Default)	2 Clear CMOS Contents	3 Pin 1

Figure 5-1. Clearing the CMOS Contents

A

Specifications

This appendix lists the electrical, mechanical, and environmental specifications of the NI PXI-8186/8187 embedded computer.

Electrical

Voltage (V)	Current (A)			
	Typical		Maximum	
	NI PXI-8186	NI PXI-8187	NI PXI-8186	NI PXI-8187
+3.3	4 A	4 A	5 A	5 A
+5	6.5 A	7 A	8 A	9 A
+12	0.15 A	0.15 A	0.2 A	0.2 A
–12	0 A	0 A	0 A	0 A

Physical

Board dimensions..... PXI 3U-size module
8.1 cm × 13 cm × 21.6 cm
(3.2 in. × 5.1 in. × 8.5 in.)

Slot requirements ..... One system slot plus three controller expansion slots

Compatibility ..... Fully compatible with PXI specification

MTBF..... 170,248 h

Weight..... 1.0 kg (2.2 lb) typical

Operating Environment

Ambient temperature range

Chassis	NI PXI-8186/8187	NI PXI-8186/8187 Extended Temperature Option
PXI-1000B	5–40 °C	0–55 °C
PXI-1002	5–40 °C	0–50 °C
PXI-1006	5–45 °C	0–55 °C
PXI-1010	Not recommended	0–35 °C
PXI-1011	5–40 °C	0–55 °C
PXI-1042	5–40 °C	0–55 °C
PXI-1045	5–45 °C	0–55 °C
Note: Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.		

Relative humidity range.....10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Altitude .....2000 m (at 25 °C ambient temperature)

Pollution Degree 2

For indoor or enclosed area use only.

Caution Clean the PXI-8186/8187 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Storage Environment

NI PXI-8186/8187

Ambient temperature range .....–20 to 65 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

NI PXI-8186/8187 Extended Temp. Option

Ambient temperature range .....–40 to 85 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range ..... 5% to 95% noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operational shock ..... 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

Random vibration

Operating ..... 5 to 500 Hz, 0.3 g_{rms} (with solid-state hard drive)

Nonoperating ..... 5 to 500 Hz, 2.4 g_{rms}

(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class B.)

Note For full EMC compliance, operate this device with shielded cabling. In addition, all covers and filler panels must be installed. Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1
- CAN/CSA C22.2 No. 61010-1

Note For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions.....EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Immunity .....EN 61326:1997 + A2:2001, Table 1

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Note For EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety).....73/23/EEC

Electromagnetic Compatibility
Directive (EMC).....89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

B

Technical Support and Professional Services

Visit the following sections of the National Instruments Web site at ni.com for technical support and professional services:

- **Support**—Online technical support resources at ni.com/support include the following:
  - **Self-Help Resources**—For answers and solutions, visit the award-winning National Instruments Web site for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on.
  - **Free Technical Support**—All registered users receive free Basic Service, which includes access to hundreds of Application Engineers worldwide in the NI Developer Exchange at ni.com/exchange. National Instruments Application Engineers make sure every question receives an answer.

    For information about other technical support options in your area, visit ni.com/services or contact your local office at ni.com/contact.
- **Training and Certification**—Visit ni.com/training for self-paced training, eLearning virtual classrooms, interactive CDs, and Certification program information. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit ni.com/alliance.
- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification.

- **Calibration Certificate**—If your product supports calibration, you can obtain the calibration certificate for your product at `ni.com/calibration`.

If you searched `ni.com` and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Glossary

Symbol	Prefix	Value
n	nano	10^{-9}
μ	micro	10^{-6}
m	milli	10^{-3}
k	kilo	10^{3}
M	mega	10^{6}
G	giga	10^{9}
T	tera	10^{12}

Symbols

°	Degrees
Ω	Ohms
%	Percent

A

A	Amperes
AC	Alternating Current
ASIC	Application-specific integrated circuit

B

B	Bytes
backplane	An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins

BIOS	Basic Input/Output System; BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.

C

C	Celsius
cache	Small portion of high-speed memory used for temporary storage of frequently used data
CMOS	Complementary Metal Oxide Semiconductor; a process used in making chips
CompactPCI	An adaptation of the PCI specification for industrial and/or embedded applications that require a more robust mechanical form factor than desktop PCI. CompactPCI provides a standard form factor for those applications requiring the high performance of PCI as well as the small size and ruggedness of a rack-mount system.

D

DC	Direct Current
DDR	Double Data Rate
DIMM	Dual In-line Memory Module
DMA	Direct Memory Access; a method by which data is transferred between devices and internal memory without intervention of the central processing unit
DRAM	Dynamic RAM (Random Access Memory); storage that the computer must refresh at frequent intervals

E

ECP	Extended Capabilities Parallel
EDO	Extended Data Out
EEPROM	Electronically Erasable Programmable Read Only Memory

embedded controller	An intelligent CPU (controller) interface plugged directly into the PXI backplane, giving it direct access to the PXI bus. It must have all of its required PXI interface capabilities built in.
EMC	Electromagnetic Compatibility
EMI	Electromagnetic interference
EPP	Enhanced Parallel Port
expansion ROM	An onboard EEPROM that may contain device-specific initialization and system boot functionality

F

FCC	Federal Communications Commission

G

g	1. Grams 2. A measure of acceleration equal to 9.8 m/s^2
GPIB	General Purpose Interface Bus (IEEE 488)
g_{rms}	A measure of random vibration; the root mean square of acceleration levels in a random vibration test profile

H

Hz	Hertz; cycles per second

I

I/O	Input/output; the techniques, media, and devices used to achieve communication between machines and users
IDE	Integrated Drive Electronics; hard disk and built-in controller
IEEE	Institute of Electrical and Electronics Engineers
in.	Inches

instrument driver	A set of routines designed to control a specific instrument or family of instruments, and any necessary related files for LabWindows/CVI or LabVIEW
interrupt	A means for a device to request service from another device
interrupt level	The relative priority at which a device can interrupt
IRQ*	Interrupt signal
ISA	Industry Standard Architecture; the original PC bus architecture, specifically the 16-bit AT bus

K

KB	Kilobytes of memory

L

LAN	Local Area Network; communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system, and a communications link.
LED	Light-emitting diode

M

m	Meters
master	A functional part of a PXI device that initiates data transfers on the PXI backplane. A transfer can be either a read or a write.
MB	Megabytes of memory
MTBF	Mean time between failure
MTTR	Mean time to repair

N

NI-488 or NI-488.2	The National Instruments software for GPIB systems
NI-DAQ	The National Instruments software for data acquisition instruments
NI-VISA	The National Instruments implementation of the VISA standard; an interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments
NMI	Non-maskable interrupt; high-priority interrupt that cannot be disabled by another interrupt. It is used to report malfunctions such as parity, bus and math coprocessor errors.

P

PCI	Peripheral Component Interconnect. The PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines.
PCMCIA	Personal Computer Memory Card International Association
peripheral	Any hardware device connected to a computer, such as a monitor, keyboard, printer, plotter, disk or tape drive, graphics tablet, scanner, mouse, and so on
POSC	Power On Self Configuration
PXI	PCI eXtensions for Instrumentation; an open implementation of CompactPCI that adds electrical features that meet the high-performance requirements of instrumentation applications by providing triggering, local buses, and system clock capabilities. PXI also offers two-way interoperability with CompactPCI products.

R

RAM	Random Access Memory; the computer's primary workspace
RAMDAC	Random Access Memory Digital to Analog Converter; the VGA controller chip that maintains the color palette and converts data from memory into analog signals for the monitor
resource	Hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and I/O address

RMS	Root mean squared. *See also* g_{rms}.
RTC	Real Time Clock; an electronic circuit that maintains the time of day and also can provide timing signals for timesharing operations

S

s	Seconds
slave	A functional part of a PXI device that detects data transfer cycles initiated by a PXI bus master and responds to the transfers when the address specifies one of the device's registers
SO-DIMM	Small Outline Dual In-line Memory Module
SRAM	Static RAM; a memory chip that requires power to hold its content. It does not require refresh circuitry as a dynamic RAM chip, but it does take up more space and uses more power.
ST	Start Trigger
Star Trigger Slot	This slot is located at Slot 2 in a PXI mainframe and has a dedicated trigger line between each peripheral slot. This slot would be used for a module with ST functionality that can provide individual triggers to all other peripherals.

U

USB	Universal Serial Bus

V

V	Volts
VGA	Video Graphics Array; the minimum video display standard for all PCs

W

W	Watts

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